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Abstract

Measurements of fall-out radioactivity in the I roes in 1973 are presented. ^{90}Sr (and ^{137}Cs in most instances) was determined in regularly collected samples of precipitation, grass, milk, fish, sea water, bread, and drinking water. In addition, analyses of spot samples of lamb, potatoes, sea plants, vegetables, eggs, and human bone were carried out. Estimates of the mean contents of ^{90}Sr and ^{137}Cs in the human diet in the Faroes in 1973 are given.

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CONTENTS

ABBREVIATIONS AND UNITS

FP	fission products
pCi	picocurie, 10^{-12} Ci, $\mu\mu$Ci
nCi	nanocurie, 10^{-9} Ci, mμCi
mCi	millicurie, 10^{-3} Ci
MPC	maximum permissible concentration
S. U.	pCi ^{90}Sr/g Ca
O. R.	observed ratio
M. U.	pCi ^{137}Cs/g K
n Sr	natural (stable) Sr
S. D.	standard deviation, $\sqrt{\frac{\Sigma(\bar{x}-x_i)^2}{(n-1)}}$
S. E.	standard error, $\sqrt{\frac{\Sigma(\bar{x}-x_i)^2}{n(n-1)}}$
S. S. D.	sum of squares of deviations, $\Sigma(\bar{x}-x_i)^2$
f	degrees of freedom
s^2	variance
v^2	ratio between the variance in question and the residual variance
P	probability fractile of the distribution in question
$\bar{x}$	mean values
Σ	sum
η	coefficient of variation, relative standard deviation
A:	η: 20-33%
B:	$\eta > 33\%$

1. INTRODUCTION

1.1.

The fall-out programme for the Faroes, which was initiated in 1962[1] in close co-operation with the National Health Service and the chief physician of the Faroes, was continued in 1973. Samples of human bone were obtained in 1973 from Dronning Alexandrines Hospital in Thorshavn.

1.2.

The present report will not repeat information concerning sample collection and analysis already given in Risø Reports Nos. 64, 86, 108, 131, 155, 181, 202, 221, 246, 266, and 292[1].

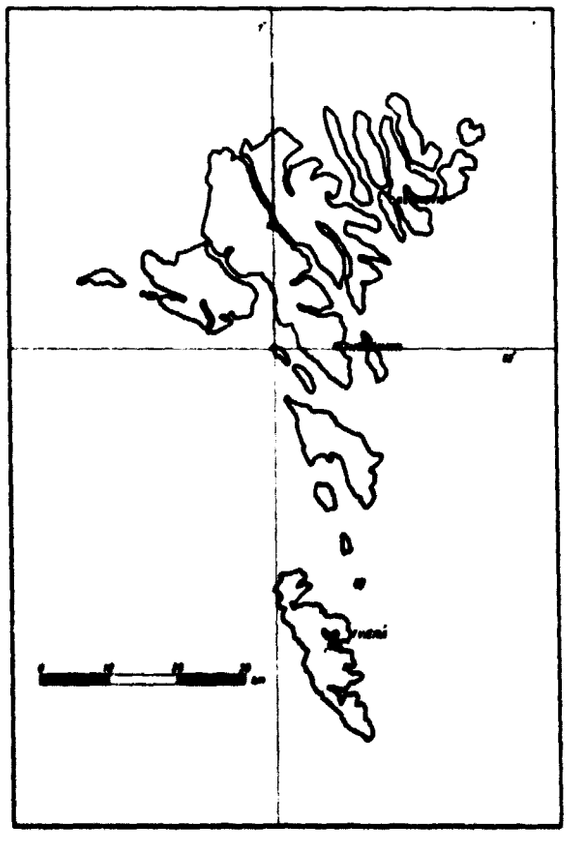

Fig. 2.1.1. The Faroes.

1.3.

The estimated mean diet of the Faroese as used in this report is unchanged as compared with 1962, i.e., it is still based on the estimate given by Professor E. Hoff-Jørgensen, Ph.D.

1.4.

The present investigation was carried out along with corresponding examinations of fall-out levels in Denmark and Greenland, described in Risø Reports Nos. 305[2] and 307[3] respectively.

2. RESULTS AND DISCUSSION

2.1. Strontium-90 in Precipitation

Table 2.1 shows the ^{90}Sr content in precipitation collected at Høyvig (near Thorshavn) and Klaksvig in 1973. The amount of precipitation at Klaksvig was a factor of 1.4 greater than that found at Høyvig, and the amount of fall-out at Klaksvig was 1.1 times that measured at Høyvig.

The mean activity of ^{90}Sr in precipitation in 1973 was approx. one half of the 1972 levels in the Faroes. The amount of precipitation was somewhat higher in 1973 than in 1972.

Table 2.1

Strontium-90 in precipitation in the Faroes in 1973

Month	Høyvig		Klaksvig	
	pCi $^{90}Sr/l$	mCi $^{90}Sr/km^2$	pCi $^{90}Sr/l$	mCi $^{90}Sr/km^2$
Jan.	0.36	0.055	0.34	0.059
Feb	0.28	0.061	0.31	0.075
Mar.	0.68	0.102	0.38	0.074
Apr.	0.86 A	0.111 A	0.69	0.103
May	0.60 B	0.020 B	0.57	0.095
June	0.50	0.047	0.38	0.027
July	0.38 B	0.021 B	0.38	0.047
Aug.	0.47 B	0.047 B	0.33 B	0.025 B
Sep.	0.39 B	0.017 B	0.39	0.032
Oct.	0.14 B	0.029 B	0.23	0.041
Nov.	0.22	0.010	0.14 B	0.037 B
Dec.	0.62	0.134	0.38 A	0.100 A
1973	$\bar{x}$ 0.45	Σ 0.654 Σ_{mon} 1442	$\bar{x}$ 0.36	Σ 0.715 Σ_{mon} 1994

A: Relative S.D.: 20-33%

B: Relative S.D.: >33%

2.2. Strontium-90 and Caesium-137 in Grass

Grass samples were collected near Thorshavn in 1973 as in the previous years. Table 2.2 shows the results. The mean S.U. content of the grass during the summer months was estimated at 235 S.U., and the mean S.U. in milk during June-September was 24.5 S.U. at Thorshavn (cf. 2.3), i.e., the observed ratio between S.U. in milk and in grass was 0.10 (mean 1965-73 0.10 ± 0.01 (1 S.E.)). The 1973 S.U. levels in grass were 1.4 times the 1972 levels. As compared with Danish grass in 1973[2], we found the S.U. levels in the Faroese grass to be higher by a factor of approx. 7 in the summer months. The mean content of ^{137}Cs during the summer months was estimated at 0.2 nCi $^{137}Cs/kg$.

The mean ratio between ^{137}Cs and ^{90}Sr in the grass (pCi/kg) was 2.2 in 1973. (Mean 1965-73: 2.2 ± 0.2).

Table 2.2

Strontium-90 and Caesium-137 in grass from Thorshavn 1973

Month	pCi $^{90}Sr/g$ ash	pCi $^{90}Sr/kg$	pCi $^{90}Sr/g$ Ca	pCi $^{137}Cs/g$ ash	$^{137}Cs/^{90}Sr$
June	9.1	174	314	8.7	0.95
Aug.	4.2	-	156	14.7	3.50

2.3. Strontium-90 and Caesium-137 in Milk

As in the previous years[1], fresh milk samples collected weekly were obtained from Thorshavn, Klaksvig, and Tværå. Strontium-90 and Caesium-137 were determined in bulked monthly samples.

Table 2.3.1 shows the results and tables 2.3.2, 2.3.3 and 2.3.4 the analysis of variance of the S.U., M.U., and pCi $^{137}Cs/l$ figures respectively The variation between months was not significant. As also observed in previous years, the variation between locations was significant. The highest ^{137}Cs and ^{90}Sr levels were found in the milk from Tværå and Klaksvig and the lowest in the Thorshavn milk.

Fig. 2.3.1 shows the quarterly S.U. values and fig. 2.3.2 the quarterly pCi $^{137}Cs/l$ levels since 1962. The annual mean values for 1973 were 23 S.U. (~28 pCi $^{90}Sr/l$) and 154 M.U. or 251 pCi $^{137}Cs/l$, i.e. the 1973 levels were a little lower than the 1972 mean levels. The predicted levels in Faroese milk from 1973 were 23 S.U. and 187 M.U. Prediction equations were calculated for the period 1962-70 and for an effective half life of ^{90}Sr (and ^{137}Cs) in the soil of 4 years. (Cf. ref. 2, Appendix C):

Table 2.3.1

Strontium-90 and Caesium-137 in milk from the Faroes in 1973

Month	Thorshavn			Klaksvig			Tværá			Mean		
	S.U.	pCi ^{137}Cs/l	M.U.	S.U.	pCi ^{137}Cs/l	M.U.	S.U.	pCi ^{137}Cs/l	M.U.	S.U.	pCi ^{137}Cs/l	M.U.
Jan.	17	124	74	27	230	148	27	337	200	24	230	141
Feb.	18	120	74	23	229	136	22	397	268	21	249	159
Mar.	20	128	71	19	158	96	23	329	203	21	205	123
Apr.	17	107	71	22	212	139	30	374	230	23	231	147
May	20	123	77	19	222	144	31	460	284	23	268	168
June	23	176	101	28	255	148	22	280	166	24	237	138
July	23	157	92	29	157	93	25	313	189	26	209	125
Aug.	29	240	143	29	190	113	30	484	295	29	305	184
Sep.	23	199	120	31	119	75	27	510	319	27	276	171
Oct.	19	127	77	22	368	227	23	555	360	21	350	221
Nov.	*(17)	125	76	*(22)	164	100	*(24)	278	168	(21)	189	115
Dec.	15	122	75	23	239	153	25	414	252	21	258	160
Mean	20	146	88	24	212	131	26	394	244	23	251	154

*Estimated from Oct. and Dec. The sample were lost.

$$pCi\ ^{90}Sr/g\ Ca = 2.57\ d_{(i)} + 1.67\ d_{(i-1)} + 0.57\ A_{by(i-1)}$$

$$pCi\ ^{137}Cs/g\ K = 10.8\ d_{(i)} + 7.64\ d_{(i-1)} + 4.93\ A_{by(i-1)}$$

The observed ^{137}Cs milk levels were lower than the predicted ones; that was the opposite of the situation in Denmark[2].

Table 2.3.2

Analysis of variance of ln pCi ^{90}Sr/g Ca in Faroese milk in 1973 (from table 2.3.1)

Variation	SSD	f	s^2	v^2	P
Betw. months	0.414	10	0.0414	2.17	>90%
Betw. locations	0.428	2	0.2139	11.21	>99.9%
Remainder	0.382	20	0.0191		

Table 2.3.3

Analysis of variance of ln pCi ^{137}Cs/g K in Faroese milk in 1973 (from table 2.3.1)

Variation	SSD	f	s^2	v^2	P
Betw. months	0.804	11	0.0731	1.10	-
Betw. locations	6.620	2	3.3102	49.84	>99.95%
Remainder	0.371	1	0.3708		

Table 2.3.4

Analysis of variance of ln pCi ^{137}Cs/l Faroese milk in 1973 (from table 2.3.1)

Variation	SSD	f	s^2	v^2	P
Betw. months	0.734	11	0.0667	1.00	-
Betw. locations	6.363	2	3.1814	47.61	>99.95%
Remainder	1.470	22	0.0668		

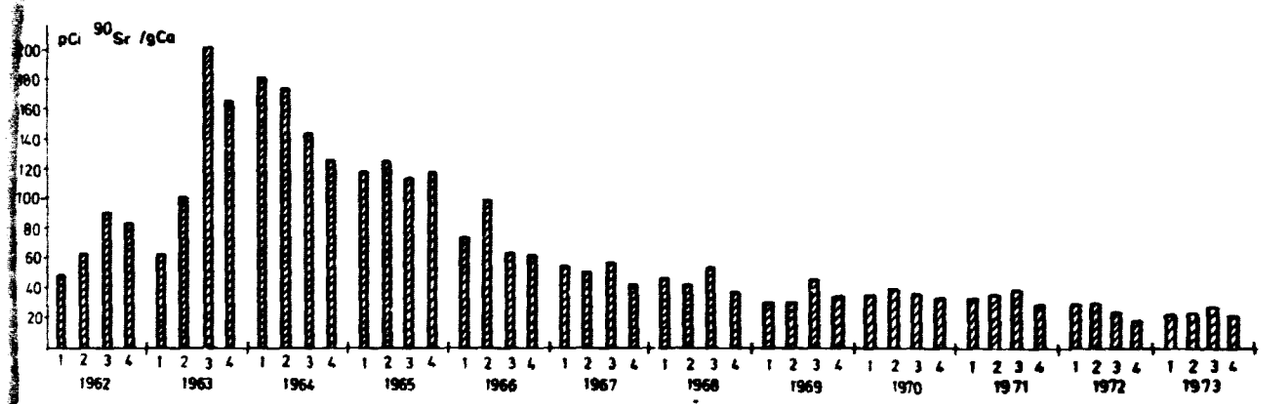

Fig. 2.3.1. Strontium-90 in Faroese milk, 1962-1973.

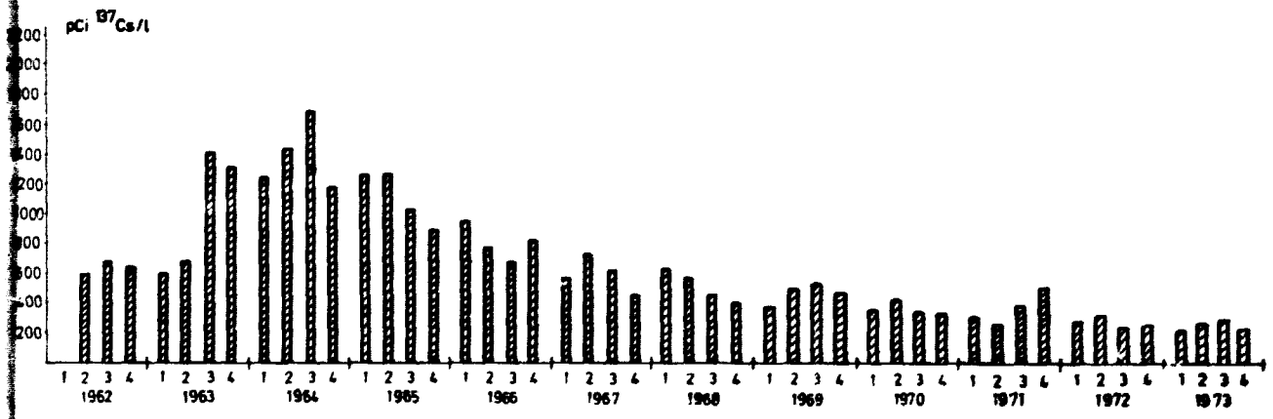

Fig. 2.3.2. Caesium-137 in Faroese milk, 1962-1973.

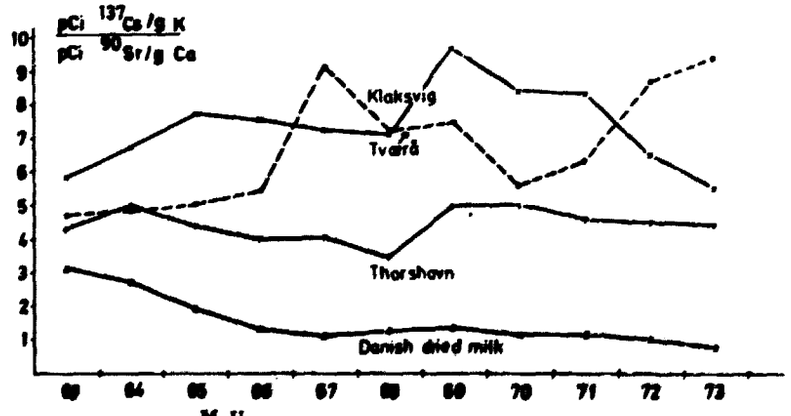

Fig. 2.3.3. $\frac{M.U.}{S.U.}$ ratios in Faroese and Danish milk, 1963-73.

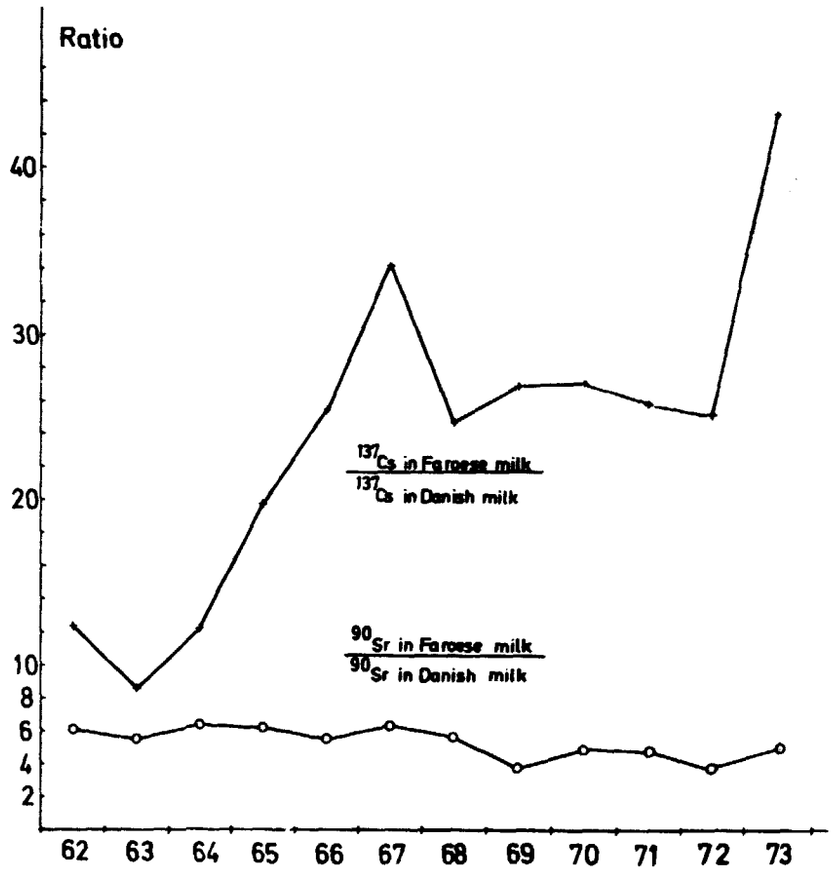

Fig. 2.3.4. A comparison between Faroese and Danish milk levels, 1962-73.

The annual mean values of the M.U./S.U. ratio in Faroese milk are shown in fig. 2.3.3.

The mean M.U./S.U. ratio in 1973 was 6.8 ± 0.8 during the grazing period (May-October), and in the winter time it was 6.7 ± 0.4, i.e. unchanged. This is in agreement with previous observations[1].

Fig. 2.3.4 shows a comparison between the ^{90}Sr and ^{137}Cs levels in Faroese- and Danish-produced milk. It is evident that the soil uptake plays an important role for the ^{137}Cs levels in the Faroes. The ratios between the ^{90}Sr levels in Faroese and Danish milk have shown a decreasing tendency through the years.

2.4. Strontium-90 and Caesium-137 in Terrestrial Animals

Dried lambs' meat was obtained once in 1973.

The levels were 41 pCi ^{90}Sr/kg or 169 S.U. and 2 nCi ^{137}Cs/kg or 490 M.U. The bone level was 225 pCi ^{90}Sr/g Ca.

2.5. Strontium-90 and Caesium-137 in Fish

Table 2.5.1 shows the ^{90}Sr and ^{137}Cs levels in fish collected in 1973 in the Faroes. The mean levels in fish were 0.63 pCi ^{90}Sr/kg (S.E.: 0.11) and 14.1 pCi ^{137}Cs/kg (S.E.: 1.4).

Table 2.5.1

Strontium-90 and Caesium-137 in sea animals from the Faroes in 1973

Sampling months		Species	Sample type	pCi ^{90}Sr/kg	pCi ^{90}Sr/g Ca	pCi ^{137}Cs/kg	pCi ^{137}Cs/g K
Jan.	Fish	Gadus aeglefinus	Meat	1.11	7.5	14.1	3.6
Jan.	"	Gadus callarias	Meat	0.65 A	6.0 A	11.1	3.2
March	Fish	Gadus aeglefinus	Meat	0.93 A	6.9 A	21.2	5.0
March	"	Gadus callarias	Meat	0.77 B	6.7 B	14.6	2.6
Nov.	Fish	Gadus aeglefinus	Meat	0.15 B	1.8 B	12.1	3.4
Nov.	"	Gadus callarias	Meat	0.40 B	3.2 B	10.5	3.0
Dec.	Fish	Gadus aeglefinus	Meat	0.59	4.1	18.9	6.1
Dec.	"	Gadus callarias	Meat	0.40 B	3.9 B	10.1	3.0

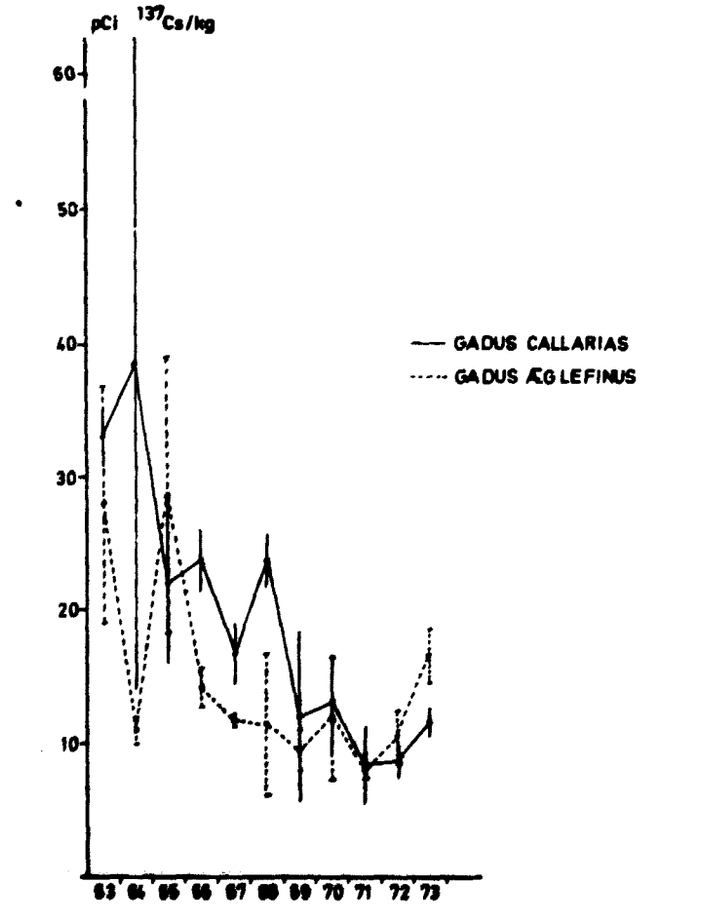

Fig. 2.5.1. Caesium-137 levels in meat of Cod and Haddock collected in the Faroes, 1963-73. (1 S.E. indicated).

2.6. Strontium-90 in Drinking Water

Drinking-water samples were collected as previously[1]. Table 2.6.1 shows the results and table 2.6.2 the analysis of variance. As in the previous years the drinking water from Thorshavn contained more ^{90}Sr than that from Tværå (cf. the explanation in Risø Report No. 181[1]).

Fig. 2.6.1 shows the two-monthly mean levels of ^{90}Sr in drinking water from the three locations since 1962.

The mean level in 1973 was 0.36 pCi $^{90}Sr/l$, i.e. not significantly different from the 1972 level. It is remarkable that the ^{90}Sr level in drinking water does not show the same reduction in activity as observed for precipitation (cf. 2.1). This shows that the drinking water depends rather on accumulated fall-out than on fall-out rate.

Table 2.6.1

Strontium-90 in drinking water from the Faroes in 1973
pCi $^{90}Sr/l$

Month	Thorshavn	Klaksvig	Tværå
Jan.	0.84	0.41	0.36
Mar.	0.60	0.23	0.32
May	0.65	0.26	0.35
July	0.33 A	0.18	0.21
Sep.	0.28	0.20 B	0.22 B
Nov.	0.59	0.17	0.25
1973	0.55	0.24	0.28

A: Relative S.D.: 20-33%
B: Relative S.D.: > 33%

Table 2.6.2

Analysis of variance of ln pCi $^{90}Sr/l$ drinking water in 1973 (from table 2.6.1)

Variation	SSD	f	s^2	v^2	P
Betw. months	1.599	5	0.3198	9.96	>99.5%
Betw. locations	2.281	2	1.1406	35.52	>99.95%
Remainder	0.321	10	0.0321		

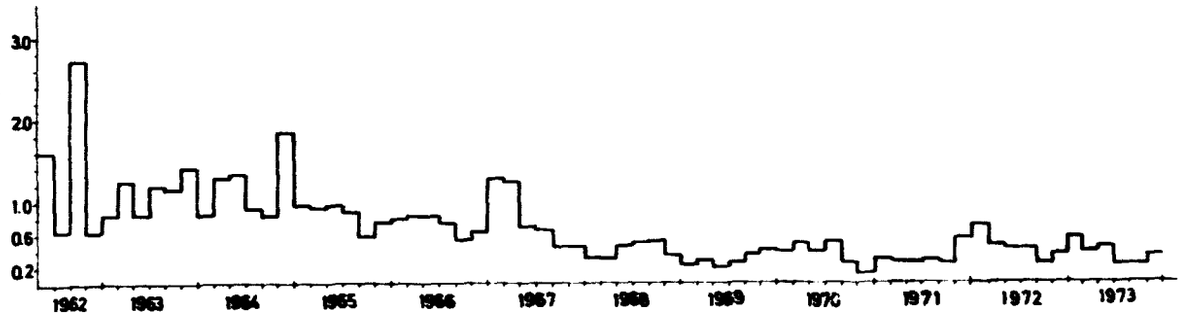

Fig. 2.6.1. Strontium-90 in drinking water, 1962-73 (mean of Thorshavn, Klaksvig, and Tværå).

2.7. Strontium-90 and Caesium-137 in Miscellaneous Samples

2.7.1. Soil

No soil samples were collected in 1973 from the Faroes. From earlier years' observations we estimate the accumulated fall-out at Thorshavn at 66 mCi $^{90}Sr/km^2$ and that at Klaksvig at 132 mCi $^{90}Sr/km^2$.

2.7.2. Sea Water

Surface sea water was collected near Thorshavn four times in 1973. The ^{90}Sr mean level was 0.095 pCi $^{90}Sr/l$. (1 S.E.: 0.003).

Fig. 2.7.2 shows the ^{90}Sr levels since 1962.

The samples were also analysed for ^{137}Cs. The mean was 0.32 ± 0.05 pCi $^{137}Cs/l$. The $^{137}Cs/^{90}Sr$ ratio was: 3.4 ± 0.5. This was probably significantly higher than the expected one of 1.6.

Table 2.7.2

Strontium-90 and Caesium-137 in sea water from the Faroes in 1973

	Sampling month	^{90}Sr pCi/l	^{137}Cs pCi/l	Salinity in o/oo
Skopen Fjord	Apr.	0.10	0.22 A	34.2
Thorshavn	June	0.10	0.46 B	34.8
Thorshavn	Aug.	0.09	0.34	35.8
Thorshavn	Nov.	0.09	0.27 B	34.9

A: Relative S.D.: 20-33%
B: Relative S.D.: > 33%

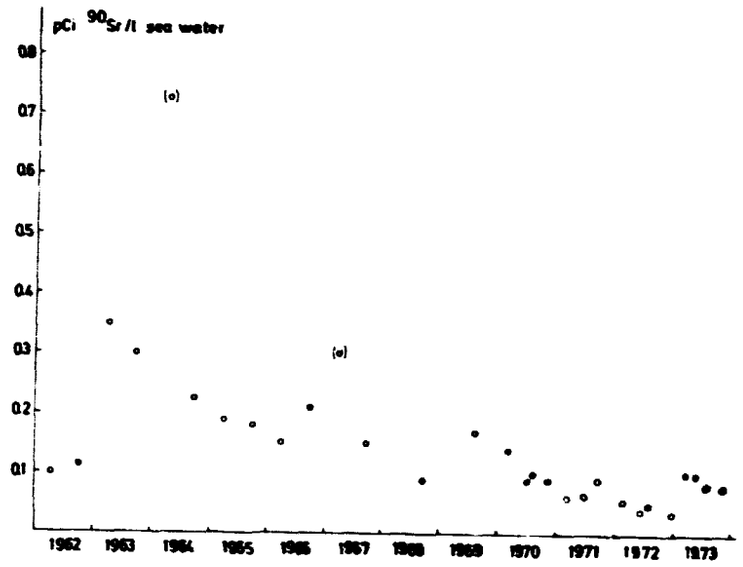

Fig. 2.7.2. Strontium-90 in Faroese sea water, 1962-73.

2.7.3. Sea Plants

Two samples of laminaria were obtained in 1973. Table 2.7.3 shows the ^{90}Sr, ^{137}Cs and stable Sr determinations.

Table 2.7.3

Strontium-90 and Caesium-137 in sea plants from the Faroes in 1973

Sampling month	Species	pCi ^{90}Sr/g ash	pCi ^{90}Sr/g Ca	pCi ^{137}Cs/g ash	pCi ^{137}Cs/g K	mg Sr/g Ca
Mar.	Laminaria	0.17	2.37	0.26 A	1.4 A	66.9
Aug.	Laminaria	1.79	16.16	0.29 A	1.4 A	63.7
A: Relative S.D.: 20-33%						

2.7.4. Vegetables

Table 2.7.4 shows the results of the ^{90}Sr and ^{137}Cs determinations. The high ^{137}Cs level in potatoes is remarkable, but in agreement with earlier years observations[1].

Table 2.7.4

Strontium-90 and Caesium-137 in vegetable and fruits from the Faroes in 1973

Sampling month	Species	pCi ^{90}Sr/kg	pCi ^{90}Sr/g Ca	pCi ^{137}Cs/kg	pCi ^{137}Cs/g K
Aug.	Red currant	14.3	34	28.4	9.2
Aug.	Cauliflower	1.6	10	10.0 B	2.5 B
Aug.	Carrot	6.2	29	5.1 B	2.3 B
Nov.	Potatoes	9.6	266	430	129
B: Relative S.D.: > 33%					

2.7.5. Bread

As in the previous years[1], rye bread and white bread were collected in Thorshavn in June and December. The mean levels in white bread were 4.4 pCi ^{90}Sr/kg and 7.2 pCi ^{137}Cs/kg. The rye bread collected in 1973 contained on the average 14 pCi ^{90}Sr/kg and 19 pCi ^{137}Cs/kg, i.e. the white bread levels were half of the 1972 levels, while the rye bread levels were only a little less than that of 1972. The Faroese bread levels were lower than the Danish[2]. The white bread from December did apparently not contain any creta praeparata.

Table 2.7.5

Strontium-90 and Caesium-137 in Faroese bread in 1973

Month	Sort	pCi ^{90}Sr/kg	pCi ^{90}Sr/g Ca	pCi ^{137}Cs/kg	pCi ^{137}Cs/g K
June	White bread	3.9	3.2	7.1 A	6.6 A
June	Rye bread	14.0	20.3	25.6	13.7
Dec.	White bread	4.9	27.0	7.4 A	5.7 A
Dec.	Rye bread	13.9	9.7	13.3	6.5

2.7.6. Eggs

Eggs were collected from Thorshavn in June and December 1973. Table 2.7.6 shows the results. The mean levels were 1.0 pCi ^{90}Sr/kg (2.5 S.U.) and 2.9 pCi ^{137}Cs/kg.

Table 2.7.6

Strontium-90 and Caesium-137 in Faroese eggs in 1973

Month	pCi ^{90}Sr/kg	pCi ^{90}Sr/g Ca	pCi ^{137}Cs/kg	pCi ^{137}Cs/g K
June	1.96	3.3	2.9 B	2.2 B
Dec.	1.05	1.7	-	-
B: Relative S.D.: > 33%				

2.7.7. Butter

We measured the ^{90}Sr content in a sample of butter collected in the Faroes in 1973. We found 6 pCi ^{90}Sr/kg butter (71 S.U.).

2.8. Humans

In 1973 a number of human bone samples were obtained from Dronning Alexandrines Hospital in Thorshavn. Table 2.8 shows the results.

Table 2.8

Strontium-90 in human vertebrae and femurs collected in the Faroes in 1973

Age	Month of death or sampling	Sex	pCi ^{90}Sr/g Ca
0	2-11	F&M	1.54*
85 years	-	F	2.03**
89 "	-	M	1.12**

* Bulked sample from 12 individuals

** Femur (from amputation)

The mean level in newborn bone was 1.5 pCi ^{90}Sr/g Ca, and from Danish measurements since 1963 we know that the observed ratio between newborns' bone and mothers' diet is 0.11. Hence the mothers' diet should have contained appros. 14 pCi ^{90}Sr/g Ca. In 1972[1)] the ^{90}Sr level of the Faroese adult human diet was estimated at 13 pCi ^{90}Sr/g Ca, and in 1973 we found (cf. 3) 11 pCi ^{90}Sr/g Ca. As the bone samples were collected in February-November, it is reasonable that the estimated diet level is approx. 12. We must therefore conclude that the newborn bone levels were close to that to be expected from the diet estimate.

The ratio of ^{90}Sr in vertebrae to that in femoral diaphyses has been determined for adults in Czechoslovakia, where the average value for 51 samples was 2.28 $\pm$ 0.22 in 1969[5)]. The ratio decreases with time (in 1968 it was 2.68 $\pm$ 0.31) and we will use a ratio of 2 in our recalculation of the Faroese data. Hence we estimate the Faroese mean level in adult vertebrae from the 2 femoral analyses to 3.2 pCi ^{90}Sr $\pm$ 0.9 or approx. twice the Danish level, which is in good agreement with a Faroese ^{90}Sr diet level twice the Danish[1, 2)].

3. ESTIMATE OF THE MEAN CONTENTS OF ^{90}Sr AND ^{137}Cs IN THE HUMAN DIET

3.1. Annual Quantities

As in 1962[1)], the annual quantities are based on the estimate made by

Professor E. Hoff-Jørgensen, Ph.D., on the assumption of a daily per capita intake of approx. 3000 calories.

3.2. Milk and Cream

75% of the milk consumed in the Faroes is assumed to be of local origin, and 25% comes from Denmark. Hence the ^{90}Sr content in milk consumed in the Faroes in 1973 was 1.2 · (0.75 · 23 + 0.25 · 4.7) = 22 pCi ^{90}Sr/kg, and the ^{137}Cs content was 0.75 · 251 + 0.25 · 3.6 = 189 pCi ^{137}Cs/kg (cf. 2.3 and ref. 2). 1 kg milk contains 1.2 g Ca.

3.3. Cheese

Nearly all cheese consumed in the Faroes is of Danish origin, and the Danish figures from ref. 2 were used: 40 pCi ^{90}Sr/kg and 4 pCi ^{137}/kg.

3.4. Grain Products

As most grain products are imported from Denmark, the Danish figures for 1973[2)] were used in the calculation of the Faroese levels. The mean daily consumption of grain products in the Faroes is, as in Denmark, 80 g rye flour, 120 g wheat flour, and 20 g grits. Hence the mean concentration of ^{90}Sr in grain products consumed in the Faroes in 1973 becomes 15 pCi ^{90}Sr/kg and 17 pCi ^{137}Cs/kg. We realize (cf. 2.7.5) that these activity figures probably overestimate the actual intake of ^{90}Sr from grain products in the Faroes.

3.5. Potatoes

All potatoes consumed in the Faroes are assumed to be of local origin. The values from table 2.7.4 were used, i.e. 10 pCi ^{90}Sr/kg and 430 pCi ^{137}Cs/kg.

3.6. Other Vegetables and Fruit

As the amount of vegetables and fruit grown in the Faroes is limited, the Danish figures from 1973[2)] were used. Thus the mean contents in vegetables other than potatoes were 9 pCi ^{90}Sr/kg and 2 pCi ^{137}Cs/kg, and the mean contents in fruit were 4 pCi ^{90}Sr/kg and 3 pCi ^{137}/kg.

3.7. Meat and Eggs

The meat and egg consumption in the Faroes is estimated to consists of 50% locally produced mutton (or lambs' meat), 25% local whale meat, and 25% sea birds and eggs.

The mutton contained 41 pCi ^{90}Sr/kg and 2 nCi ^{137}Cs/kg (cf. 2.4). Whale meat from 1970[1] contained 5.5 pCi ^{90}Sr/kg and 850 pCi ^{137}Cs/kg, sea birds from 1970[1] and eggs (cf. 2.7.6): 1.5 pCi ^{90}Sr/kg and 1.0 pCi ^{90}Sr/kg, and 15 and 2.9 pCi ^{137}Cs/kg respectively.

Hence we estimate the mean content of ^{90}Sr in meat and eggs consumed in 1973 to be

$$0.50 \cdot 41 + 0.25 \cdot 5.5 + 0.25 \cdot \left(\frac{1.5 + 1.0}{2}\right) = 22 \text{ pCi } ^{90}Sr/kg$$

and the ^{137}Cs content to be

$$0.50 \cdot 2000 + 0.25 \cdot 850 + 0.25 \cdot 9 = 1215 \text{ pCi } ^{137}Cs/kg.$$

3.8. Fish

All fish consumed in the Faroes is of local origin, and the mean contents in fish, obtained from subsection 2.5, were 0.6 pCi ^{90}Sr/kg and 14 pCi ^{137}Cs/kg.

3.9. Coffee and Tea

The Danish figures for 1972[2] were used, i.e. 24 pCi ^{90}Sr/kg and 106 pCi ^{137}Cs/kg.

3.10. Drinking Water

The mean value found in table 2.6.1 was used, i.e. 0.36 pCi ^{90}Sr/l. The ^{137}Cs content was estimated to be approx. one fourth (the ratio found in New York tap water in 1964[4]) of the ^{90}Sr content, i.e. 0.1 pCi ^{137}Cs/l.

Tables 3.1 and 3.2 show the diet estimates of ^{90}Sr and ^{137}Cs respectively.

3.11. Discussion

Fig. 3 shows the Faroese diet levels since 1962.

The 1973 ^{90}Sr levels in total diet were a little lower than in 1972, but the ^{137}Cs levels were higher due to the high levels in the samples of potatoes and lamb this year.

The main contributors of the ^{90}Sr content in the Faroese diet were milk products and cereals, which together accounted for approx. 2/3 of the total ^{90}Sr content in the diet in 1973. As regards ^{137}Cs, milk products, meat (lamb), and potatoes were the most important contributors. In 1973, 97% of the total ^{137}Cs content in the diet came from these products.

The Faroese mean diet contained two times as much ^{90}Sr and approx. twenty times as much ^{137}Cs as the Danish 1973 diet[2].

Table 3.1

Estimate of the mean content of ^{90}Sr in the human diet in the Faroes in 1973

Type of food	Annual quantity in kg	pCi ^{90}Sr per kg	Total pCi ^{90}Sr	Percentage of total ^{90}Sr in food
Milk and cream	146	22	3212	45.2
Cheese	7.3	40	292	4.1
Grain products	80	15	1200	16.9
Potatoes	91	10	910	12.8
Vegetables	20	9	180	2.5
Fruit	18	4	72	1.0
Meat and eggs	37	22	814	11.4
Fish	91	0.6	55	0.8
Coffee and tea	7.3	24	175	2.5
Drinking water	548	0.36	197	2.8
Total			7107	

The mean annual calcium intake is estimated to be 600 g (approx. 200-250 g of creta praeparata). Hence the pCi ^{90}Sr/g Ca ratio in the total Faroese diet was 12 S.U., and the mean daily intake was 19 pCi ^{90}Sr.

Table 3.2

Estimate of the mean content of ^{137}Cs in the human diet in the Faroes in 1973

Type of food	Annual quantity in kg	pCi ^{137}Cs per kg	Total pCi ^{137}Cs	Percentage of total ^{137}Cs in food
Milk and cream	146	189	27594	24.0
Cheese	7.3	4	29	0.0
Grain products	80	17	1360	1.2
Potatoes	91	430	39130	34.0
Vegetables	20	2	40	0.0
Fruit	18	3	54	0.0
Meat and eggs	37	1215	44955	39.0
Fish	91	14	1274	1.1
Coffee and tea	7.3	106	774	0.7
Drinking water	548	0.1	55	0.0
Total			115285	

The mean annual intake of potassium is estimated to be approx. 1200 g. Hence the pCi ^{137}Cs/g K ratio becomes 96 and the daily intake of ^{137}Cs 316 pCi.

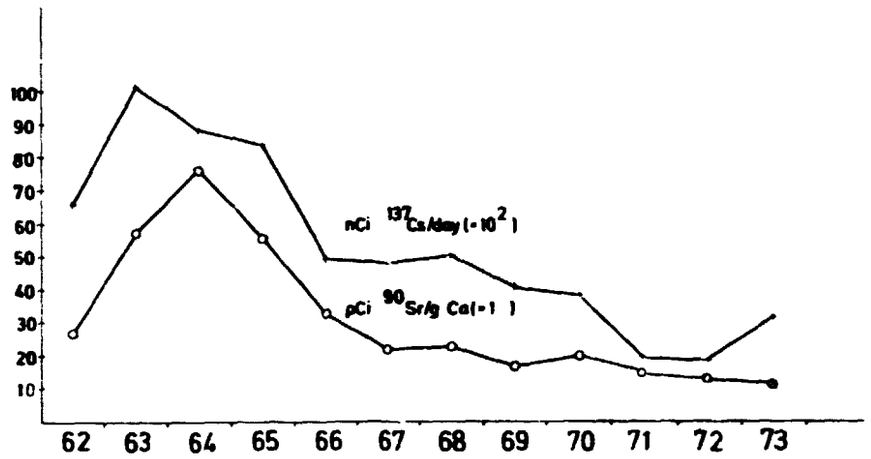

Fig. 3. Strontium-90 and Caesium-137 in Faroese diet, 1962-73.

4. CONCLUSION

4.1.

The ^{90}Sr fall-out rate in the Faroes in 1973 was approx. 0.7 mCi $^{90}Sr/km^2$. The accumulated fall-out by the end of 1973 was estimated at approx. 99 mCi $^{90}Sr/km^2$ (the mean of Thorshavn and Klaksvig).

4.2.

The mean level of ^{90}Sr in Faroese milk was 23 S.U. or 28 pCi $^{90}Sr/l$. The ^{137}Cs concentration was 154 pCi $^{137}Cs/g$ K, or 251 pCi $^{137}Cs/l$.

Lamb contained 41 pCi $^{90}Sr/kg$ and 2 nCi $^{137}Cs/kg$. Fish showed mean levels of 0.6 pCi $^{90}Sr/kg$ and 14 pCi $^{137}Cs/kg$.

The mean content of ^{90}Sr in drinking water was 0.36 pCi/l.

The mean daily per capita intakes with the diet in the Faroes in 1973 were estimated at 19 pCi ^{90}Sr (12 S.U.) and 316 pCi ^{137}Cs (96 pCi $^{137}Cs/g$ K).

4.3.

From the Faroese and Danish diet estimates and from measurements on Faroese and Danish bones, the Faroese bone levels in 1973 were estimated as follows: in newborn children: approx. 1.5 S.U.;
in infants (1 month - 4 years): approx. 4 S.U. (depending upon the amount of locally produced milk in the diet of the infants); in children and teen-

agers (5 - 19 years): approx. 3 S.U.; in adult vertebrae: approx. 3 S.U.

The mean content of ^{137}Cs in the Faroese adult was estimated at approx. 17 nCi or approx. 121 pCi $^{137}Cs/g$ K. This estimate was based on the Faroese and Danish diet estimated in 1972-73 and on Danish whole-body measurements in 1973.

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